122-TP-001-001

ECS PDR Management Plan

Technical Paper

Technical paper - Not intended for formal review or Government approval.

November 1994

Prepared Under Contract NAS5-60000

RESPONSIBLE ENGINEER

Robert Hoffman /s/ 11/22/94

Robert Hoffman Date
EOSDIS Core System Release A Manager

SUBMITTED BY

Peter G. O'Neill /s/ 11/22/94

Peter G. O'Neill Date
System Integration and Planning Office Manager

This page intentionally left blank.

Abstract

The ECS PDR will demonstrate that ECS segment implementation architectures satisfy the system level architecture presented and approved at the System Design Review (SDR). The activities of the preliminary design phase define the system architecture from the subsystem and configuration item design presented at SDR to the hardware and software component level within the three ECS segments: the Science Data Processing Segment (SDPS), the Flight Operations Segment (FOS), and the Communications and Systems Management Segment (CSMS). Trade studies, modeling, prototyping, and engineering and management support tasks also progress to corresponding levels of definition.

The ECS PDR design provides a segment-focused, streamlined, resource-conservative, application of traditional PDR requirements. System engineering and management guide the segment activities in a coordinated preliminary design process tailored to involve representatives of the user and customer community early in the actual preliminary design process as well as in the review events at its conclusion.

The PDR events of the three segments are arrayed in independent, but coordinated, tracks within the ECS PDR model and period from December, 1994 through February, 1995. The events build to an exposition of the preliminary design within a scope appropriate to the external missions supported by the planned ECS releases.

Keywords: PDR, SDPS, CSMS, FOS, Segments, Wrap Up, PDR Season

This page intentionally blank

Contents

4. ECS PDR Detailed Design and Schedule

5. PDR Documentation

6. PDR Logistics

Figures

Tables

Appendix A. Object Methodology PDR Checklist

Appendix B. PDR Document Delivery Schedule

This page intentionally left blank.

1. Introduction

1.1 Purpose

This paper describes the objectives, design and schedule, and management and engineering plans for the ECS Preliminary Design Review. It is written at the summary level to provide a concise overview of the ECS Preliminary Design Review for the ECS community, and to define a clear road map to completion of the preliminary design phase of ECS development.

1.2 Organization

This paper is organized as follows: Section 2 introduces the objectives of the ECS preliminary design review. The approach to implementing these objectives in the PDR, and its scope of coverage are described in Section 3. Section 4 specifies the design and schedule of PDR events. Section 5 describes the PDR documentation plan. The paper concludes with a summary of the ECS PDR logistics plan in Section 6.

1.3 Review and Approval

This paper is an informal document approved at the Office Manager level. It does not require formal Government review or approval; however, it is submitted with the intent that review and comments will be forthcoming. Questions regarding technical information contained within this Paper should be addressed to the following ECS contacts:

- Bob Hoffman, Release A Manager, PDR Manager, (301) 925-0435, bhoffman@eos.hitc.com
- Richard Barbiere, Releases Manager, (301) 925-0678, rbarbier@eos.hitc.com
- Joe Guzek, ECS Chief Engineer, (301) 925-0339, joe@eos.hitc.com
- Kristin Wheeler, ECS Data Manager, (301) 925-0322, kwheeler@eos.hitc.com

Questions concerning distribution or control of this document should be addressed to:

Data Management Office
The ECS Project Office
Hughes Applied Information Systems
1616 McCormick Dr.
Landover, MD 20785

This page intentionally left blank.

2. PDR Objectives

The ECS Preliminary Design Review (PDR) will demonstrate that ECS segment implementation architectures satisfy the system level architecture presented and approved at the System Design Review (SDR). The activities of the preliminary design phase define the system architecture from the subsystem and configuration item design presented at SDR to the hardware and software component level within the three ECS segments the Science Data Processing Segment (SDPS), the Flight Operations Segment (FOS), and the Communications and Systems Management Segment (CSMS). Trade studies, modeling, prototyping, and engineering and management support tasks also progress to corresponding levels of definition. The documents specified for PDR in the Contract Data Requirements List (CDRL), describe the preliminary design. Documents are delivered in advance of the PDR event to form the basis of the review.

The ECS Statement of Work guides the scope of the PDR to a segment focus, and segment technical, customer, and user requirements guide its objectives and design within the context of the system design.

Consequently, the ECS PDR is a segment-focused, streamlined, resource-conservative, application of traditional PDR requirements. System engineering and management guide the segment activities in a coordinated preliminary design process tailored to involve representatives of the user and customer community early in the actual preliminary design process as well as in the review events at its conclusion. Details of the PDR design are presented in sections three and four.

The ECS PDR will achieve its major objectives by accomplishing the following:

2.1 Present an Integrated ECS System Design

The fundamental requirement for PDR is to demonstrate that the preliminary design of the segments optimize operation within the system context as defined at SDR. This must be accomplished by describing system-level scenarios that track functional operation across segment interfaces, and by sub-scenarios which describe the internal operations of the segments to subsystem and component levels.

Segment architectures must demonstrate how all requirements are allocated to design components which are assigned to either the formal or incremental development tracks, and how they later come back together into an integrated, maintainable and operable segment.

Segment PDR events must cover a common set of PDR design topics to ensure uniform design definition.

2.2 Describe Segment Designs

The ECS PDR is designed to allow focused concentration on segment designs flowing from the approved system design. Segment managers, in agreement with their ESDIS ETM, are free to design their PDR events to suit individual segment needs. Required segment PDR topics include:

1. Level 4 requirement walkthroughs
2. Segment scenario walkthroughs (within context of system scenarios)
3. Segment design walkthroughs
4. External and internal interface descriptions

These general topics will be supported by description of the prototyping, modeling, trades and studies accomplished to arrive at, and validate, the designs. Relevant prototypes will be demonstrated as part of the PDR process.

2.3 Show Segment Development, Test and Integration Planning

Segment release and development planning advances in the preliminary design process and will be documented in segment release plans and segment development plans, as well as segment integration and test plans .

The ECS system is large and complex with many internal and external interfaces among its three segments and with external entities. Successful implementation will require thorough planning of the system architecture to identify its component parts and the interactions and interfaces among them; both for construction of the components, and their integration into a cohesive system.

The segment I&T plan is especially important for SDPS and CSMS segments which are developing parts of their segment on the incremental track. Their I&T plans must clearly show how those components will be integrated with other components developed on the formal track and with components implemented with COTS acquisition and integration.

2.4 Provide Depth of Focus

The segment orientation of the ECS PDR allows focused, in-depth technical review of segment designs. PDR events will devote most of the PDR time and attention to segment events and topics, and the three segments will execute their events on parallel, concurrent tracks. This design will permit several days of segment PDR participation on each segment, rather than the few hours that might be possible in a centralized, serial set of traditional presentations.

2.5 Allow Independent Segment Progress

Each of the three ECS segments face differing challenges due to their technologies, user groups, and maturity of implementation methodologies. The FOS, with its mature technology, small well-defined user group, and implementation from an available base of heritage software, will

not require as much time in the preliminary design phase as CSMS and SDPS. SDPS is at the other extreme. A new architecture, broad, diverse user group, and extensive new custom software militates for more time to complete a cohesive design. CSMS, with heavy COTS hardware and software dependencies also requires extended design, but somewhat less than SDPS.

Consequently, the PDR periods and timing of events will be allowed to flow independently for each segment within a reasonable time window sometimes termed "the PDR Season". FOS PDR events begin earliest, followed by CSMS, then SDPS. Those ready first do not wait for PDR, or to advance to the detailed design phase to follow. The design of the ECS PDR is based upon individual segment progress, but also assures inter segment engineering of interfaces and dependencies.

Additionally, segment PDR activities will be under the control of the segment manager in concert with the direction of the segment ETM. The success of PDR events and satisfaction of PDR success criteria will be judged by peer review in the form of a segment PDR panel. The panel will be a small technically cognizant group, asked to evaluate design maturity, and empowered to recommend to ETMs that authorization to proceed to detailed design be granted.

2.6 Provide System Topics / Issues Summary

The final segment PDR event will be followed by a system wrap up session to review the results of segment events, and to view them in the context of the system-level functions which bring them together into a system view. Presentation of system topics such as integration and test, system interfaces, V0 analysis and integration, show the concluding context for the results of segment PDR events (for detailed agenda see Section 4, ECS PDR Detailed Design). Presentation of segment PDR summaries highlighting any resulting issues complete the PDR evaluation process.

This session will be presided over by an ECS PDR Review Board which will evaluate reports from segment panels, review segment and system issues, and recommend final approval of the PDR to the ESDIS Project Office.

2.7 Streamline PDR Process

The ECS team has been challenged to accomplish the objectives of a traditional PDR, to do it with more user and customer participation in the preliminary design, and to accomplish this with less expenditure of resources and with minimal schedule impact. The proposed PDR design achieves these goals by streamlining the traditional process and reducing formality wherever possible. Some of the streamlining features of the design described in the remainder of this paper include:

1. Resources are conserved by defining early PDR events to allow external participation without adding effort to existing work.
2. Minimal additional presentation material is prepared; engineering materials are used for early interactions.

3. Travel and personnel costs are limited by allowing representatives to act for larger groups, and by concurrent scheduling of PDR events with other group meetings/planned travel where possible.
4. User and customer participation in PDR events builds on ongoing panels, working groups and teams.
5. Design issues worked in real time (fewer RIDs).
6. Reduced formal presentation, rehearsals, and preparation losses.

The implementation of these features, and the satisfaction of the objectives outlined above, are described and illustrated in the sections which follow.

3. ECS PDR Design and Scope

The PDR events of the three segments are arrayed in independent, but coordinated, tracks within the ECS PDR model and period on a timeline consistent with their development maturity. The events build to an exposition of the preliminary design within a scope appropriate to the external missions supported by the planned ECS releases.

3.1 ECS PDR Model

The placement of events in relation to each other, to system level engineering, and to the calendar is shown at summary level in Figure 3-1, The ECS PDR Model, to illustrate the concepts and the events of the ECS PDR Season. A more detailed description of all PDR events is provided in the following section (Section Four, ECS PDR Detailed Design and Schedule).

3.1.1 Distributed Event Schedule

The ECS preliminary design period began at the end of June, 1994 with the successful completion of the SDR and continues through successful completion of the final PDR event and workoff of any open actions. The ECS PDR is distributed vertically, or functionally, among individual tracks for each segment and for system level activities. It is distributed horizontally, or in time, with the events on each track taking place at a point that is selected to match design maturity and inter-track integration requirements.

The FOS, CSMS, and SDPS segment tracks run concurrent with system-level engineering and management activities. The three ECS segments will conduct preliminary design activities independently, under system-level guidance and management, culminating in a system summarization to conclude the PDR process.

Four major components constitute the PDR model: System-level engineering and Workshops, Segment Workshops, Segment PDRs, and the ECS PDR Wrap Up. Each is described below.

The figure also shows planning dates for the design and production of the documents which record the results of the ECS preliminary design activities. The segment CDRL documents are proposed to be offered in a review version (shown as D in a triangle) not less than two weeks prior to each segment PDR. This provides participants with working material for the event so they may participate in an informed manner. The documents are updated after the segment PDRs to reflect changes made as a result of the participative PDR, and are redelivered (shown as F in a triangle) approximately thirty days after the last driving event.

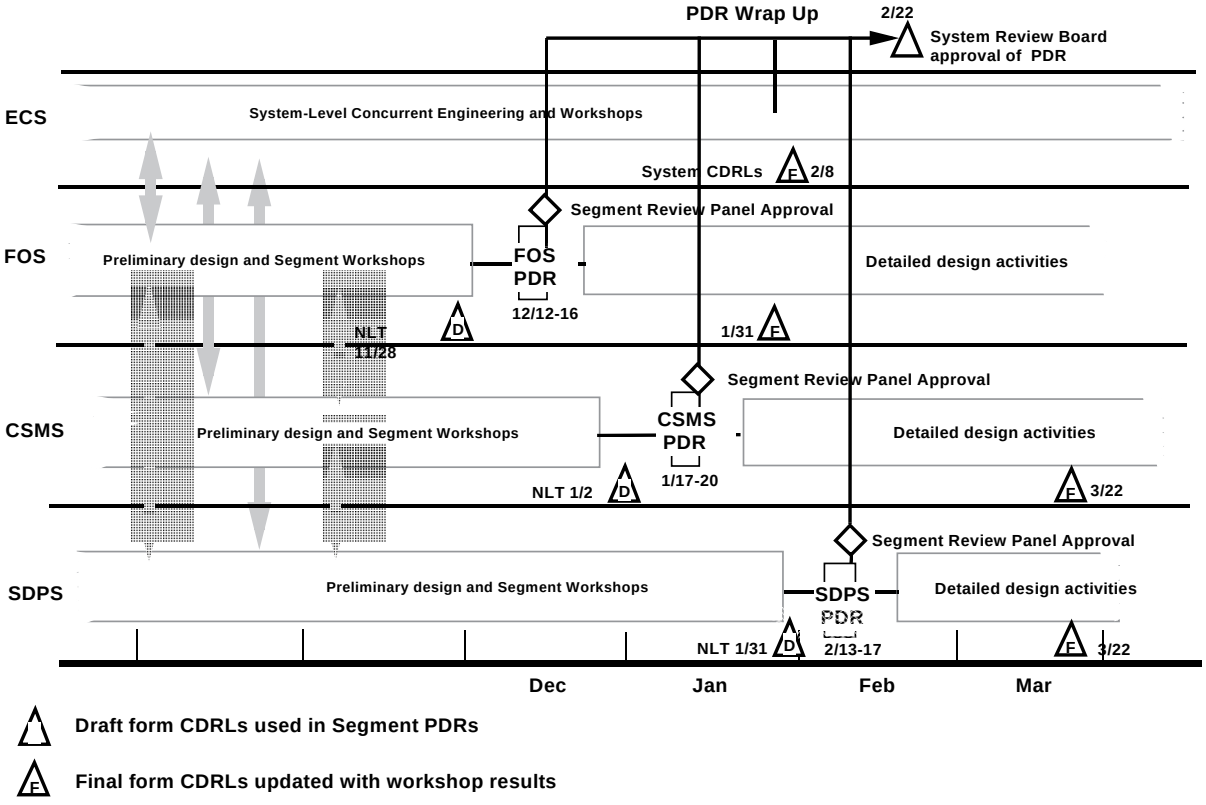

Figure 3-1. The ECS PDR Model

3.1.2 System-Level Engineering and Workshops

The system to segment and inter-segment engineering that is crucial to ECS success is indicated by the shaded vertical arrows at the left of the figure. They represent the concurrent engineering process of individuals from all ECS organizations working together in PDR coordination, working groups, and PDR events to advance the ECS design uniformly toward PDR maturity. The activities of these engineering disciplines provide the system-level framework for the subsequent design efforts of the segments. System-level engineering activities include performance modeling, interface engineering, system integration and test, RMA, security, quality assurance, and maintenance and operation engineering as primary examples. Coordination of the efforts of these system activities with their segment counterparts takes place in day-to-day coordination and in workshops where needed. Details of the preliminary design activities of these disciplines, and the workshops that are planned by them, are found in Section 4.1.

3.1.3 Segment Workshops: Shirt-Sleeve Participation in Segment Design

Segment Workshops are segment-directed, informal, working sessions providing opportunity for ESDIS and other community personnel to make direct contribution to the preliminary design process. Participation in workshops provides visibility into the preliminary design work of the

segments including segment Level 4 requirements allocation from Level 3, flowdown/ decomposition of system level scenarios to segment scenarios, and object model expansion to preliminary design level.

Segments select work in progress sessions to fit community and segment needs identifying those for external participation which are most meaningful. Service provider segments, and system-level engineering organizations take part where appropriate in an implementation of concurrent engineering, and representatives of user groups, focus teams and other working groups are invited to attend.

Individuals participating in segment workshops must be technically cognizant of the material being worked and should come expecting to make positive contribution to the success of the activities. Technical and process questions and requests for clarification are handled in the session wherever possible, and design documents are marked up to record agreements. Action items are taken to resolve those which require broader action if approved by the segment ETM. No RIDs are written as part of the workshops.

External participation in the workshops must be coordinated through ESDIS Segment ETMs and ECS Segment Managers.

Specific workshops proposed for each segment are identified and discussed in Sections 4.2, 4.3, and 4.4.

3.1.4 ECS PDR Advisory Panels and Board

A central tenet of the ECS development is the involvement of the ECS community to guide the design of its user capabilities and features. This guiding principle is embodied in the PDR process with the establishment of advisory bodies to review PDR activities and make approval recommendations to the ESDIS Project Office.

Segment PDRs will be attended and reviewed by a Segment Review Panel comprised of selected authorities in the segment functions and technologies. The ECS PDR Wrap Up will be attended and reviewed by a System Review Board comprised of selected authorities in system purpose and function.

Prior to the first Segment PDR, the corresponding Segment Review Panel and the System Review Board shall be activated and charged with their responsibility. Each SRP shall include a representative of the SRB, and the SRB shall include a representative from each SRP. Ideally, the segment panel representatives to the board will be the chair persons of their respective review panels.

Service on a segment panel will require a commitment of 5-7 days in support of the segment PDR, and System Review Board service will require 2-4 days in support of the Wrap Up.

The function of the SRPs and the SRB are outlined in the next sections. Their composition is defined in Section 4.

3.1.5 Segment PDRs: Segment Focus within System Context

Segment PDRs will be held at the dates indicated in Figure 3-1 above. Durations will vary from three to five days depending on the information needing to be conveyed. Segment PDRs address standard themes with specified success criteria in an agenda tailored to the missions and technologies of each segment.

Segment PDRs are conducted for approval of respective ESDIS ETMs with advice from Segment Review Panels. Panels are comprised of ESDIS, NASA Headquarters, and System Advisory Panel (Data Panel and DAAC) representatives. The panels, which are projected to be no larger than 10 to 12 people, will recommend segment PDR approval to segment ETMs. The ETMs, in coordination with the COTR, authorize ECS segment managers to proceed to the detailed design phase of implementation.

Other representatives of the community will be invited to attend segment PDRs up to a workable total attendance. External participation in the PDRs must be coordinated through ESDIS Segment ETMs and ECS segment managers who will determine audience size based on their assessment of group size workability for segment PDR objectives.

Proposed agendas for segment PDRs are presented in Sections 4.2, 4.3, and 4.4.

3.1.6 ECS PDR Wrap Up and Review Board

An ECS PDR Wrap Up will be conducted following the last segment PDR. The Wrap Up, scheduled for February, 1995, is a one day segment PDR panel results report, and system unification event.

Segment PDR issues are reported by the segment panels, and cross-segment program development engineering and management topics are presented to bring the segment reports into a system context. The product is a System Review Board PDR Report to the ECS COTR who approves completion of the PDR milestone. The Wrap Up will be attended by ECS, ESDIS, Segment Panels, and System Review Board representatives as well as representative community members. The make up and authority of the System Review Board are outlined in Section 4.1.2.

3.1.7 Review Inquiry Tracking

Inquiries taken in the course of PDR events, and on the documents provided to support them, are valuable contributions to the preliminary design process. Care will be taken to assure that all inquiries are heard, and those that cannot be resolved by discussion in the event will be recorded as "review items" and tracked to rapid closure.

A review inquiry may represent a specific problem, concern, question or suggestion, bearing on requirements, designs, definitions, concepts, data, or processes being discussed or reviewed. All substantial inquiries will be recorded on a Review Item Discrepancy (RID) form even if the inquiry is closed in the review.

The analysis and tracking of RIDs has historically proven to be a major technical and administrative challenge. Large numbers of RIDs have accumulated after review events, with a

correspondingly elongated post-review work off period. The work off period occurs at a time when activities should be beginning on the next phase of development.

Consequently, a more structured RID process has been defined for the ECS PDR to include these features:

1. Real time disposition. Participants are encouraged to resolve inquiries in the course of each event whenever possible without delaying the review unduly.

2. Early screening. RIDs are analyzed as they are originated to reduce the magnitude of the analysis task at the end of the PDR. RID originators and reviewers are asked to exercise restraint and good judgment in creating RIDs, and to exercise diligence in culling out duplicate or marginal RIDs as early in the process as possible. Only those RIDs which document design discrepancies should survive the segment PDR or Wrap Up screening.

3. Classification. PDR RIDs have been defined to be of two groups: those in scope to segment management, and those with broader system impact.. Segments will disposition those within their authority as early as possible, and will only bring unresolved segment RIDs, and System RIDs forward.

   a. Segment RID. A segment design discrepancy whose closure action is within the decision authority of the segment ETM is recorded as a Segment RID.

   b. System RID. A system RID documents a review item that is beyond the scope or decision authority of a single segment. A valid system RID, if uncorrected, will result in adverse impact to Level 3 requirements, external interfaces, predicted system performance, mission operations, development cost, or schedule.

4. Prioritization. RIDs will be prioritized by the panel or board governing the event. Priorities specify the urgency of implementing each item as follows.

   Priority 1 — These are Key Issues. They must be analyzed for impact and implementation immediately. Priority 1 items are formally tracked and status is reported at ECS Monthly Project Reviews until all are closed.

   Priority 2 — Must be analyzed for impact prior to CDR and included in the design if within scope. Actions taken must be reported at CDR.

   Priority 3 — Not accepted as a RID (discrepancy), but accepted as a suggestion that will be analyzed for implementation at the option of the cognizant ETM (Sponsor).

The formality involved in handling review items will be tailored to the formality of each PDR event as shown in Table 3 -1.

All RIDs are recorded in the ESDIS PDR RID database by ESDIS personnel, and are tracked to closure. Responsibility for definition of appropriate RID closure actions rests with the ECS Office Manager (Responder) and the ESDIS ETM (Sponsor) responsible for the event which produced them. Closure requires the approval of the RID Sponsors and GSFC RID Review Board. Further details of RID processing are specified in the ECS RID Management Plan.

Table 3-1. Review Item Tracking

Event	Tracking Item	Authority to Accept/Close
Workshop	Action Items	ETM / ECS Office Manager
Segment PDR	Action Items and RIDs	ESDIS Segment ETM (Sponsor)
ECS PDR Wrap Up	RIDs	GSFC RID Review Board

Figure 3-2 illustrates the origination and disposition of review items from the three levels of PDR events and their tracking among the event levels. The flow of activities begins with the workshops at Point 1, and flows through the Segment PDRs at Point 2, reaching completion with the Wrap Up at Point 3.

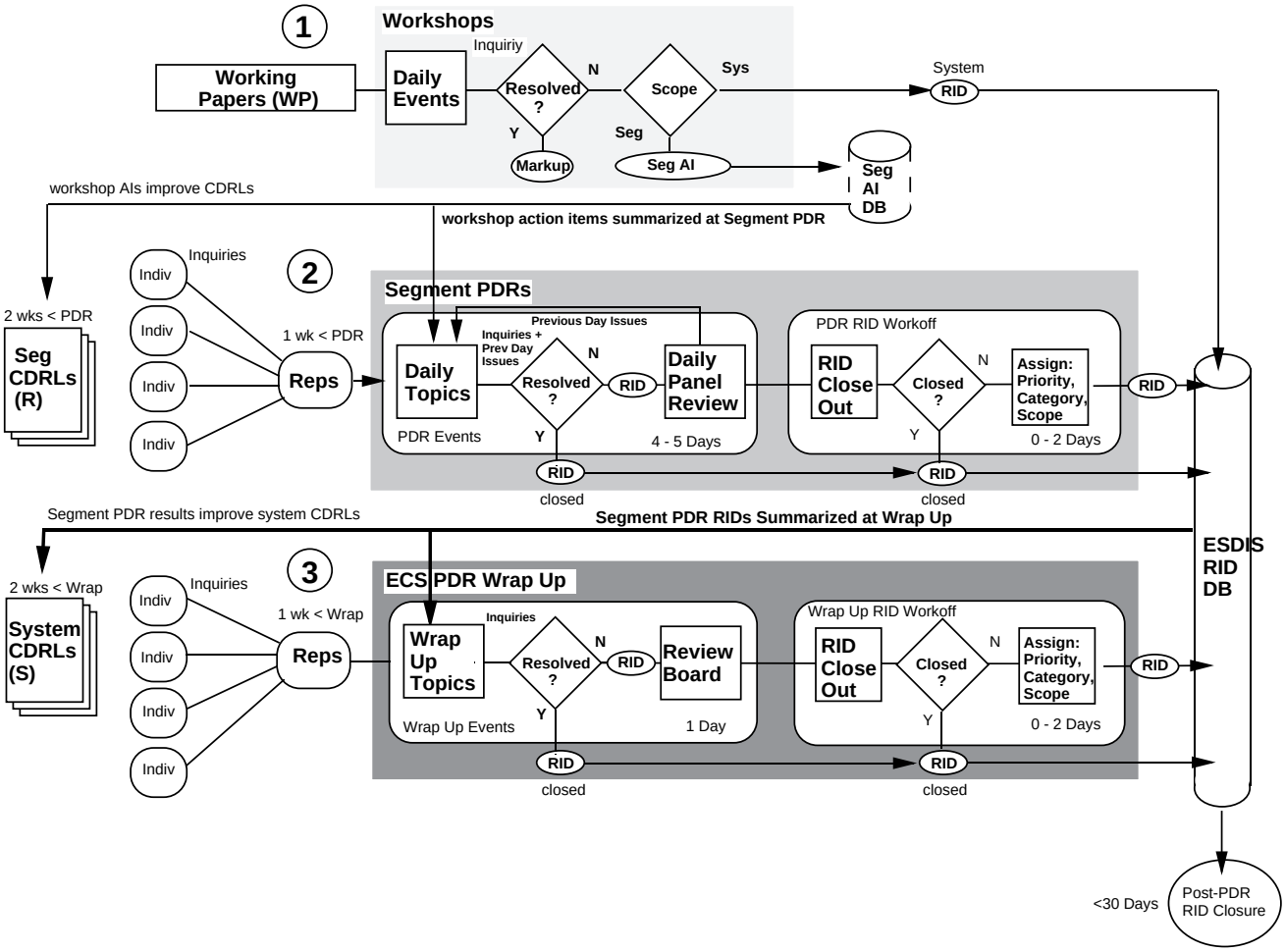

Figure 3-2. Review Item Tracking Flow

PDR Work Shops. Workshops are defined to include all coordination working sessions prior to PDRs. They include the operations, and segment design, coordination telephone conferences conducted to allow external participation with minimum schedule disruption and travel cost for external contributors. Being informal, and using working paper documents as review documentation, workshops control unresolved review inquiries simply as action items. If an inquiry is resolved in discussion as it is raised, no further action is needed (inquiries which affect documented subjects are recorded by real-time document redlines). This is indicated in the figure by the diamond in which the question: "resolved ?" is posed, and the "Markup" balloon is indicated for a Y(es) answer. If the answer is N(o), the inquiry may be recorded as an action item in a data base maintained by the host office, or as a System RID depending on its scope. If the resolution of the inquiry is beyond the authority of the ECS Office Manager and ESDIS ETM, it is recorded as a System RID in the ESDIS PDR RID database. Segment workshop action items are worked off as rapidly as possible with the intent of closing all before the segment PDR. Those not closed are reviewed in the PDR for elevation to RID status.

Segment PDRs and the ECS PDR Wrap Up. The creation, evaluation, and tracking of review inquiries in segment PDRs and the Wrap Up is done with RIDs .

The PDRs and Wrap Up are attended by designated representatives of the organizations and institutions which comprise the ECS community. A representative may serve as the proxy for a number of constituents. In this capacity, the representative will solicit inquiries to bring to the PDR events on the behalf of colleagues.

CDRL documents are distributed on EDHS at least two weeks in advance of the PDR event for community review and event attendance preparation. Any inquiries that are revealed in the document review are conveyed to the representative for the group a reviewer is part of, or are submitted directly to ESDIS. The representative presents accumulated inquiries in the course of PDR events.

Segment PDR. The flow of events in a segment PDR is shown in the middle bar of the figure above. All substantial inquiries, and their resolution if closed, will be recorded as a RID. At the end of each day of the segment PDRs, the review panel evaluates and prioritizes, categorizes, and evaluates the scope of accumulated RIDs.

A segment PDR RID Work Off session will be convened immediately following the last day of the PDR. The work off is performed by ECS developers, ESDIS ETM, and segment panel personnel. The purpose of the session is to determine and implement proper closure action for all open RIDs that it can resolve within its authority, time, and resources. Closed RIDs will be properly documented and retained in the database for record of the closure. RIDs which cannot be closed will be classified by priority, category, and scope and carried forward in the database.

Wrap Up. The Wrap Up is a single-day event with the review board analyzing issues at end of day. A RID Work Off session also follows the Wrap Up.

The flow of events in the ECS PDR Wrap Up is shown in the lower bar of the figure above. Review inquiry tracking is identical to the segment PDR process except for the one-day duration.

Figure 3-2 shows that System-level CDRLs are distributed and reviewed in the same fashion as the segment documents. Inquiries resulting from their review are brought to the ECS PDR Wrap Up by organizational representatives . Direct RIDs on system-level documents are also accepted by ESDIS.

A RID Work Off session will be convened immediately following the Wrap Up. This work off session performs identically to the segment RID work offs closing all possible RIDs and classifying those remaining.

In the Post-PDR period following the Wrap Up, Priority 1 (Key Issue) RIDs are worked with the goal of closing all as soon as possible. Progress is reported at the next ECS Monthly Project Review. Priority 2 items are worked as part of the detailed design process, and their disposition is reported as part of the CDR. Priority 3 items are dispositioned according to office manager and ETM plans.

3.2 PDR Scope

The definition of breadth and depth of coverage provided in the ECS PDR includes the time-phased functionality to be covered, as well as the level of definition and specification of its architectural components.

3.2.1 Segment Release Coverage

Four releases have been defined for the ECS: Release A, B, C, and D. Additionally, an early release of interface functionality, Interim Release 1 (IR-1), has been defined within Release A to support TRMM interface testing. The ECS SOW requires that an initial PDR be held, followed by an IDR for subsequent releases. The definition of scope for the PDR has been determined by the necessity and certainty of requirements to support external missions, and has resulted in this definition of PDR scope for each segment:

1. SDPS and CSMS PDR will cover Releases IR-1 and A, and any decisions for B that must be made in Rel A cycle to support B delivery
2. FOS PDR will review the preliminary design through Release B

3.2.2 Level of Segment Design Specification

The depth of architectural detail defined by successive phases of the implementation life cycle follows a logical, prescribed progression from System to Subsystem to Configuration Item to Component to Unit. The ECS SDR defined architecture to the Configuration Item level; PDR will drive the definition to the Component level.

Segment preliminary designs will be specified and described down to the component level, and the allocation of components to custom and COTS implementation will be itemized. The PDR design will specify the type and performance class of COTS that will implement each COTS component, but will not specify selections. The selections, like other definitions of detailed design, will be specified at the ECS Critical Design Review.

3.2.3 SOW PDR Requirements

Paragraph 3.2.3 of the ECS Statement of Work requires the following evaluations, analyses, demonstrations, and reviews:

> "3.2.3 The PDR and IDRs shall address performance issues across ECS segments and their elements and the integrity of specific segment/elements with the overall system design. At each segment PDR or IDR, the CO/COTR will and the Contractor shall:
>
> a. Review requirements changes since the previous PDR/IDR;
>
> b. Evaluate the progress, technical adequacy, and risk resolution (on a technical, cost, and schedule basis) of the selected design approach;
>
> c. Evaluate trade-offs associated with cost vs. performance, build vs. buy, and the allocation of segment functions to hardware and software;
>
> d. Determine the segment's compatibility with performance requirements of the ECS Specification;
>
> e. Evaluate the degree of definition of, and assess the technical risk associated with, the selected manufacturing methods/processes;
>
> f. Establish the existence and compatibility of the physical and functional interfaces among the segments and elements and other items of equipment, facilities, computer software, and personnel;
>
> g. Evaluate the results of modeling and simulation studies;
>
> h. Demonstrate how prototyping results are being applied to the design and present plans for any further prototyping evaluations that are needed before finalizing the design;
>
> i. Assess growth potential of the design elements included in the review;
>
> j. Evaluate the progress, consistency, and technical adequacy of the selected software design and test approach, compare the estimate of lines of code with the estimate at the previous review, and assess the compatibility between software requirements and preliminary design;
>
> k. Evaluate the adequacy of any hardware purchase plans, including the hardware product specifications.
>
> The data products scheduled in the ECS CDRL for delivery prior to the upcoming PDR/IDR also shall be made available for review at that PDR/IDR."

ECS PDR events will assure that all SOW requirements are satisfied.

3.2.4 PDR Object Methodology Products

Object-oriented analysis, design, and implementation techniques have been chosen for the ECS to provide the base of maintainable and evolvable software required for long-term success. The growing body of methods and norms associated with the object methods have generated expectations for certain levels of design product completion at project development milestones.

For PDR, the expected set of products for each subsystem being developed on the formal track includes:

1. Complete Object (static) model
2. Complete Dynamic Model
3. Complete Functional Model
4. Level 4 requirements trace to CSCI, H/W, Operations, Release
5. Updated trace to segment scenario
6. Updated Data Dictionary
7. Scenario based test case definitions.
8. Interface Class Definitions
9. Class Definitions.
10. Level 4 to Level 3 traceability

The use of these products will be tailored to the design dictates of each subsystem, e.g. COTS components will not be documented with object models,. Additionally, it is recognized that not all subsystems will be evenly documented to the fullest extent for PDR. Design effort will concentrate on those functions which are technically challenging, and their designs will be more fully fleshed out in the preliminary design phase to eliminate or reduce any risk that may lie there. Remaining parts of the system will be designed to the lowest level routinely as part of the detailed design phase.

3.2.5 PDR Object Methodology Products and Checklist

Object methodology suggests a set of criteria to judge the completeness of the preliminary design activity as represented in its set of products. Success criteria are defined for the following:

1. Scenarios
2. Object Models
3. Interfaces
4. Dynamic and Functional Models
5. Class definitions

The PDR completion checklist, shown in Appendix A, is based on completeness and traceability to requirements, scenarios at all levels, and all facets of interfaces.

4. ECS PDR Detailed Design and Schedule

The ECS PDR Model described in Section Three identified the major activities and events which comprise the PDR. This section examines and describes each of those activities and events as they apply to system and segment levels of preliminary design, specifying planned events and their preliminary schedules.

The timing and relationships of coordination events and documents, such as the production of working paper versions of documents to support the needs of preliminary design events, are shown in the figures that illustrate this section. Working paper documents, in this context, are portions of the technical content of a CDRL produced in preliminary form to meet information coordination requirements. In general, working papers document the subject matter for coordination workshops, and Draft documents provide the review subject matter for segment PDRs. These documents are redlined in the course of the event and go forward into final document form after PDR.

4.1 ECS System-Level PDR Activities

Activities at the ECS system level span the entire array of engineering disciplines required to perform a major system development project and to plan its maintenance and operation. Many are design disciplines which collaborated to define the SDR top-level context for segment preliminary design work. They continue activities in the PDR phase of the project guiding the segments as they continue the design process. Other system-level disciplines provide support to the segment design activities. Both types of disciplines participate in the preliminary design assuring completeness of design, traceability of allocations, and representation of the system view in all activities.

The system activities directing and supporting the preliminary design period are outlined below, along with their role in the final PDR event, the ECS PDR Wrap Up.

4.1.1 System-Level Engineering Events

Figure 4-1 illustrates the key milestones for system disciplines in the PDR period. Publication and delivery points for primary CDRL documents are also shown. System-level workshops are held to coordinate and inform ECS developers on topics which span segment boundaries They are informal sessions of people with direct need for attendance to gain information required to advance preliminary design work. ESDIS ETMs and their associates may attend system-level coordination workshops at their discretion.

This figure includes a time scale identical to those shown in later figures representing segment PDR activities to allow correlation of events.

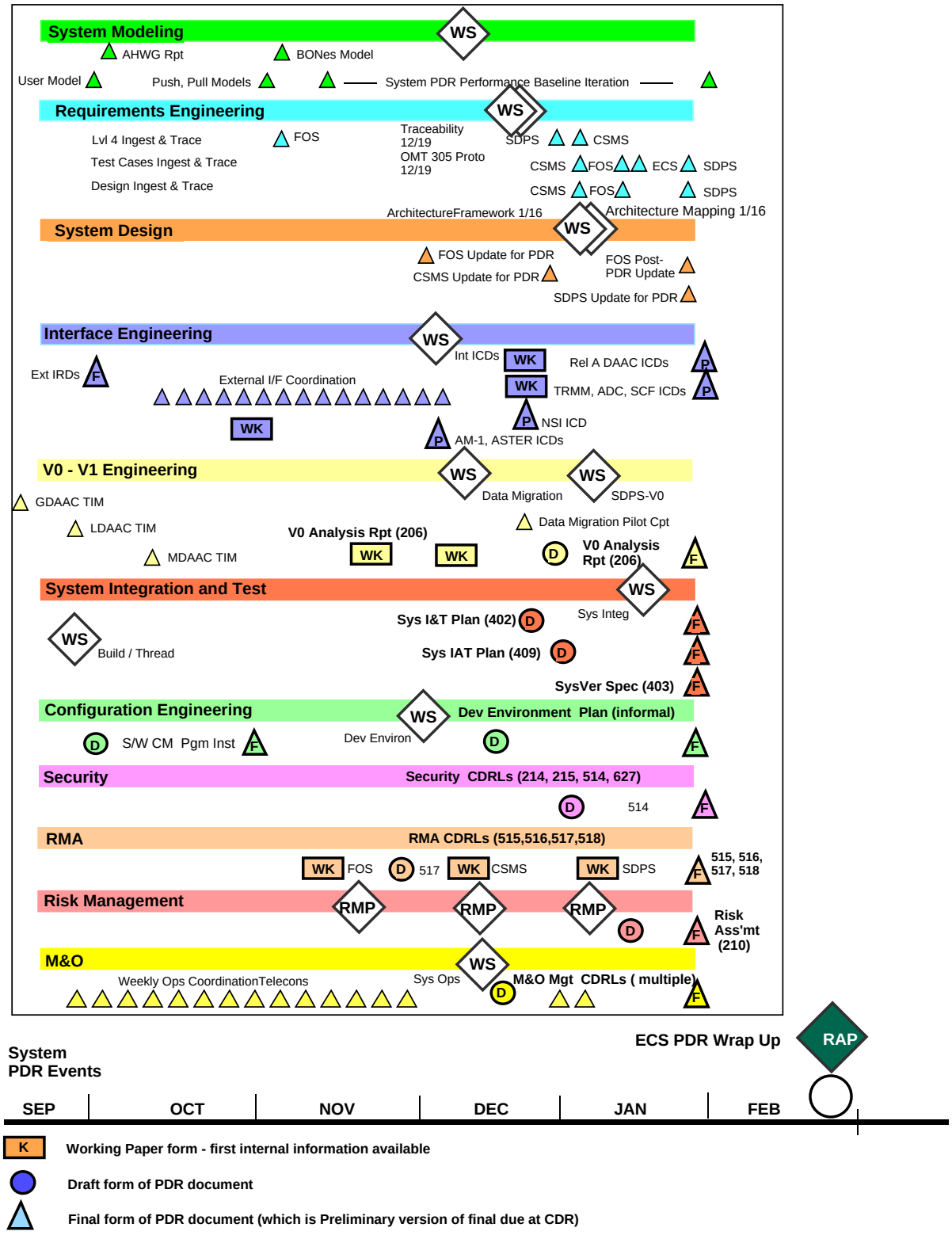

Figure 4-1. ECS System-Level Events

4.1.1.1 System Modeling

System performance modeling has been under way since the ECS SDR to evaluate predicted performance at system and segment levels. Model building, analysis, and iteration have been a combined effort by system and segment modelers establishing and refining Push and Pull models and incorporating the results of the Ad Hoc Working Group on Products (AHWGP) (an external group formed from the community to advise on ECS product modeling).

Status and planning for continuing ECS performance modeling will be discussed at a Modeling workshop in December, 1994.

4.1.1.2 Requirements Engineering

The requirements engineering function works with all levels of the project to record ECS requirements in the Requirements Traceability Management (RTM) Data Base, and to identify and validate the traceability among the various requirements levels. Interface and design traces are also established and tracked. Finally, the verification of ECS functionality is traced by matching test events, sequences and cases to designs and requirements.

Requirements engineering PDR activities include:

The use of the RTM tool for Level 2 to 3 to 4, and IRD, traceability will be demonstrated to show the completeness of the data base, and progress accomplished in the requirement to provide such traceability, in a Traceability methodology workshop during December, 1994.

The streamlining of the ECS PDR includes automated production of portions of segment design specifications from the OMT CASE tool used in the design process. The ability to achieve this is the subject of a prototype being produced and evaluated during the preliminary design phase. The tool will also be used for analysis of ECS interfaces. Results of the use of the tool for automated production of CDRL 305, and its use in the System Interface Model will be presented in an OMT application workshop in December, 1994.

4.1.1.3 System Design

The system design engineering activity produced the System Design Specification for SDR and continues to track the detailing of that system design into segment designs. A major activity is to document the entire design in an integrated system view. The results of this effort will be presented and coordinated at two workshops in the PDR time frame:

The system-level framework that will be populated with segment design details will be the topic of an ECS Architecture Framework workshop in January, 1995.

The completed effort, to PDR level, will be presented and coordinated at an ECS Architecture Mapping workshop in January, 1995.

This activity involves the identification and documentation of ECS components (H/W, S/W, Ops, Data) that will be available at Release A (and B for FOS). In addition, these components will be allocated within the Release to each operational (or test configured) DAAC. Each component will be a configuration controlled item with specific capabilities available at each Release.

The SDS document will be updated to reflect PDR designs in a Post-PDR SDS Update planned for April, 1995.

The update activity will collect information on the design scheduled to be presented at the Segment PDRs, evaluate changes to the System Design presented in the present SDS, and update the SDS accordingly. Once the Segments have completed their PDRs and drafted post-PDR (final) documentation, a final PDR version update of the SDS will be submitted for approval by ESDIS CCB.

4.1.1.4 Interface Engineering

System-level interface engineering establishes definition of external interfaces, in conjunction with EOSDIS associates, and guides the ECS definition and documentation of ECS-internal interfaces. Two workshops are planned for the PDR period to further these responsibilities:

The establishment of critical interface information requirements with the EDOS system is a matter of concern to ECS developers due to the projected late availability of the EDOS IRD and ICD. This is being worked in a series of meetings with the EDOS contractor in which it is planned to reach agreement on definition of key interface information.

Internal interfaces are documented in CDRL 313, ECS Internal Interfaces. SI&P Interface Engineering has published an annotated outline for the segments to use as they complete their volumes of this multi-volume document. Coordination of segment interface designs will be accomplished in an ECS Internal Interface Workshop hosted by SI&P Interface Engineering in December, 1994.

SI&P Interface Engineering will also build a System Level Model composed of the Interface Classes that combine to represent the ECS. Modeling of both internal and external interfaces will be validated against the Segment designs, the Segment ICDs, and the External ICDs. The analysis of this model at the workshop will ensure a consistent design across all System/Segment interfaces.

4.1.1.5 V0 - V1 Engineering

There are three major areas of focus in preparation for the PDR season: DAAC Technical Information Meetings (TIMs), Version 0 Data Migration, and Version 0 Analysis Report Update.

The DAAC TIMs are designed to support informal information exchange between the DAAC, ESDIS, and ECS team. The priority is to complete the Release A DAAC TIMs first and other DAACs as schedules permit. Major topics covered are the Release Schedule, V0 Data Migration, Operations planning, and DAAC ICD support. The DAACs present their current architecture and any issues in release preparation.

The Version 0 Data Migration is a task supported by SI&P, the Science Office, SDPS, and the DAACs with review by ESDIS. A V0 Data Migration Workshop will be held during December, 1994. There are several sub tasks within the data migration task:

- Pilot Migration Project which is performing a limited migration of several granules from each DAAC (although the volume may be increased). Paper analysis will be performed where physical migration is not possible.
- Establishment of a cost model for data migration. The cost model is calibrated by historical data gathered from the DAACs and validated using the pilot migration project.
- Release A data set analysis. Release A data set names are being provided by the DAACs. Detailed migration analysis will be presented at PDR.

The Version 0 Analysis Report update is supported by SI&P, M&O, SDPS, and CSMS segments. SDPS V0 activities are most comprehensive of the segments. An SDPS V0 Workshop will be held in January, 1995 to coordinate agreements of function and schedule. Major updates to the VAR will include how V0 has been incorporated in the PDR design as well as results of V0 testing, user response, and initial operations.

4.1.1.6 System I&T

System Integration and Test defines system level integration and test activities and events, planning, tools, and schedules, and coordinates the segment I&T activities which feed into them. These include project I&T events, methods, and documents.

The build / thread concept , which is at the heart of the development and test methodology for ECS, was reviewed and coordinated at the System-Segments Build / Thread Focus Team which met and successfully completed its work in September, 1994. The result was an agreed specification of segment software turnovers of defined functionality to system integration and test for Releases IR1, and A.

An Integration Workshop will be conducted in late January, 1995 to coordinate any issues associated with the segment PDRs, and to assess readiness for the SI&T topic of the ECS PDR Wrap Up.

4.1.1.7 Configuration Engineering

Configuration engineering is responsible for two important functions which will be reviewed as part of the PDR; development and test environment configuration, and developed software CM.

The initial plan for the ECS development environment has been developed and procurement action is in progress to establish its first increment. Coordination of the design was worked in conjunction with segment development and I&T people, and the result will be reviewed at a Development and Test Configuration Baseline / Opscon Workshop in December, 1994.

Software configuration management will be accomplished using a CM tool called Clear Case, selected for its comprehensive capability set. It will provide configuration management visibility in each step of the development life cycle beginning with software creation by developers, through the tracking of baselines through test and into operations. The use of the tool has been the subject of internal training and it is currently in use.

4.1.1.8 Security

Security planning and documentation in ECS CDRLs is coordinated by the SI&P security office. PDR Presentations of security topics will be covered as part of all segment PDRs to show implementations in the designs.

4.1.1.9 RMA

Similarly, Reliability, Maintainability, and Availability planning and documentation in ECS CDRLs is coordinated by the SI&P RMA office. PDR Presentations of RMA topics will be covered as part of all segment PDRs to show implementations in the designs, as well as a System-level summary in the ECS PDR Wrap Up.

4.1.1.10 Risk Management

Risk Management activities in support of PDR include the following: preparation of the Risk Assessment Report, several Risk Management Panels leading up to PDR, a risk assessment topic part of all segment PDRs, presentation of ECS program level risks at the PDR wrap-up.

The Risk Assessment Report (DIS 210/SE3) will be built using the existing framework for ECS Risk Management. The Risk Management Panel will be convened several times before PDR wrap-up to consider progress on the Risk Management Process as identified above and to consider new risks pertinent to the PDR time frame. For example, this needs to include the specific issue of SDPS Release A and B schedule. A driving parameter (and metric) here is clearly the custom SLOC volume. Also the COTS content and integration need to be discussed.

Each segment PDR will review previously identified risks and new risks. This will include risks on the program risk list as well as segment specific risks. This analysis will be used for the Risks Assessment Report as well as the risk discussion at the PDR wrap-up.

4.1.1.11 Maintenance & Operation

The ECS M&O Office is facilitating a weekly operations telecon with participation by ECS developers, ESDIS, the DAACs, and NOAA. Each telecon discusses, from an operations point of view, one or two functions of the design. The telecons will continue through the 9/94 - 1/95 period.

The objectives are for the operations community to understand the function(s), to identify operational issues and requirements, and to provide feedback directly to participating developers. A System Operations Workshop will be held in mid-December, 1994 to coordinate operations issues among DAAC and ECS developers.

4.1.1.12 EP4 Evaluation

The ECS Team has defined a multi-track development approach that includes an incremental development track that will build the full functionality of portions of the ECS in parallel with formal-track development to be reviewed at the PDR. Evaluation Packages are the early delivery mechanism that allows portions of ECS functionality (increments and prototypes) to be placed in the hands of selected users for evaluation and design iteration in advance of formal system releases.

EP4, composed of functionality from SDPS and CSMS, will be undergoing user evaluation during the ECS PDR Season. Demos of the EP will be conducted in conjunction with segment PDRs and the ECS PDR Wrap Up. Additionally, selected participants of the events will be invited to execute and interact with the EP and to complete a user preference survey, or to participate in usability tests of the EP. In this fashion, the project is able to expand the amount of user input on the EP without incurring additional travel expense.

4.1.2 ECS PDR Wrap Up

4.1.2.1 Wrap Up Agenda

Table 4-1. ECS PDR Wrap Up Agenda

Day	Topic	Sub-Topic	Description / Purpose
	System Engineering Summaries	System Architecture	incorporation of segment designs
		System Interface Summary	External and inter-segment
		V0 Transition, Data Migration, Reuse	Pilot Migration 1 chart Cost Model Results for high priority 2 charts Release A data migration plans 4 charts Operations migration 1 chart schedule 1 chart V0 Reuse Recap quantitative chart on rqts RRDB entries 1 chart SDPS-EP, modeling, design... 1 chart CSMS networks reuse/accounting 1 chart processes, tirekickers, WG, early interaction w/users 1 chart
		System I&T (mapped with segment I&T)	
		Release Management	
		Risk Management	
		RMA	
	ECS Maintenance and Operation	Operation Scenarios	
		Maintenance Scenarios	
		DAAC Planning	
	Segment PDR Workshop Summaries	FOS	Action Item and issues summary
		CSMS	
		SDPS	
	Readiness for Detailed Design	Development and Release Plans	
		Development and Test Environment	
		Configuration Management	
	ECS PDR Issues Report		System and segment consolidation

4.1.2.2 ECS Wrap Up Participants

4.1.2.2.1 Attendees

(Table to be completed after publication.)

Table 4-2. ECS PDR Wrap Up Attendance

Group / Organization	No.	Name
ESDIS (505)	20	
Data Panel	15	
NASA Headquarters	10	
GSFC Institutional	2	
DAACs	8	
Flight Projects	8	
Instrument Teams	10	
TSDIS	2	
NOAA	2	
EISA	2	
NASDA	2	
Focus Teams (Five Teams)	25	
IWG	10	
IVV	4	
ECOM	2	
EDOS	2	
Spacecraft Developers	2	
SDPS	3	
CSMS	3	
FOS	3	
System Level Dev Staff	15	
ECS Management	4	
Segment Panel s	6	
DAAC Sys Eng Liaisons	8	
Total	168	

4.1.2.2.2 System Review Board

(Table to be completed after publication.)

Table 4-3. ECS System Review Board

Group / Organization	No.	Name
Chair	1	Harris
Deputy Chair	1	Price
Members	13	King
		Dave Glover
		Barron
		Dunkum
		RJ Thompson
		Barkstrom
		Baum
		GSFC DAAC Scientist
		3 FOS representatives
		Des Jardins or Comm rep
		Abbott
Total	15	

4.2 FOS PDR Activities

The Flight Operations Segment utilizes its periodic meetings with spacecraft and instrument teams to coordinate design activities and issues during early portions of the preliminary design period. Customer and user personnel are actively involved in frequent walkthroughs of design trades, studies , and requirements and design reviews as the preliminary FOS design evolves.

CDRL production and distribution support the schedule of events shown in Figure 4-2, FOS PDR Events and Schedule.

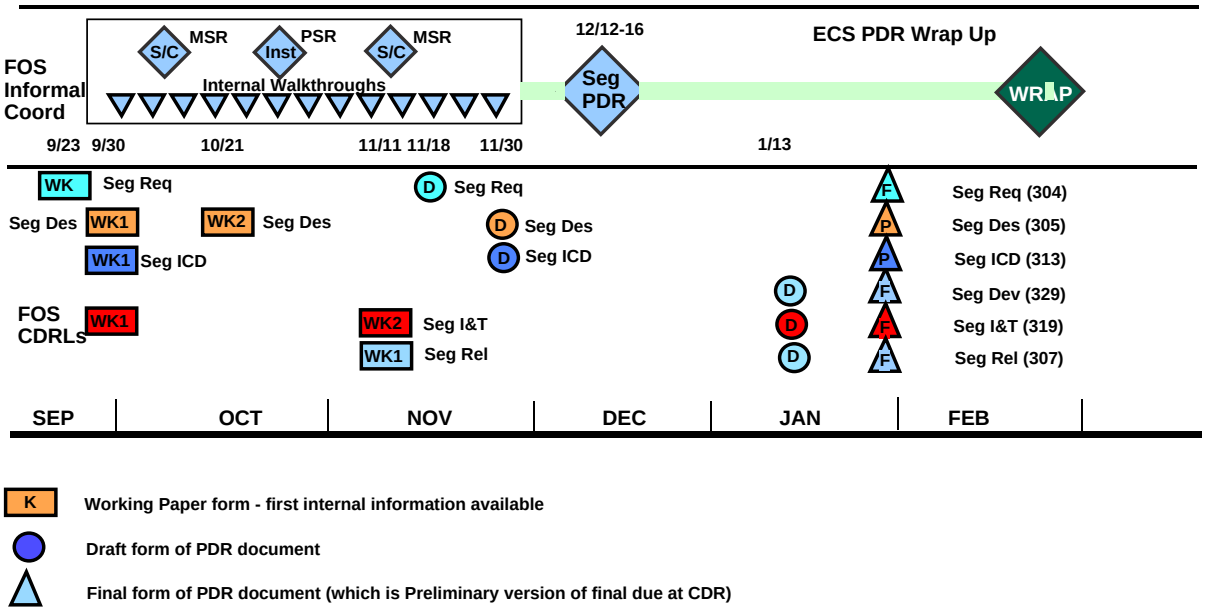

Figure 4-2. FOS PDR Events and Schedule

4.2.1 FOS Workshops

FOS workshops include both requirements coordination and design walkthrough events. The workshops shown as S/C and INST diamonds in the figure above are requirements and dependency coordination sessions with the spacecraft and instrument operations teams. The string of inverted triangles in the figure above represent internal walkthroughs of requirements and design with the FOS development team. The following roughly schedules these walkthroughs and CDRL Drafts and working papers to support them:

- Level 4 requirements working paper 9/23/94
- Level 4 requirements Walkthroughs - 9/12/94 - 9/30/94
- Level 4 requirements Draft - 11/18/94
- Segment Design working paper - 9/30 and 10/28/94
- Design Walkthroughs - 10/20/94 - 11/18/94
- Integration and Test Plan working paper - 11/11/94

- Release Plan working paper - 11/11/94
- CSMS internal segment services ICD Draft - 11/30/94

4.2.2 FOS PDR Content/Agenda

The preliminary definition of agenda topics, sub-topics and descriptions is outlined in Table 4-4. It is expected that the agenda will evolve as the preliminary design process matures designs and uncovers issues. The scope of the FOS PDR includes Release A and B functionality to support AM-1.

The FOS PDR will present the segment design to the audience through operational scenarios and concepts.

Table 4-4. FOS PDR Agenda (1 of 2)

Day	Topic	Sub-Topic	Description / Purpose
1	FOS context	• Engineering process performed to get to PDR	1 hour
		• Driving requirements	functional, performance, interface
		• External interfaces	
	Architecture	• Physical	1.5 hours
		• Logical	
		• Failure Recovery	
	Key FOS scenarios	End-to-end scenarios	
	Infrastructure	• Communications, Network, and Management	1 hour
		• User Interface	
		• Data Base	
	FOS Scheduling Activity Phase	• Long-term planning	4 hours
		• initial scheduling	
		• Final scheduling	
		• Late changes	
		• Load and memory management	
2	Real-Time Operations	• Real-time contact set-up and management	.1hours
		• Spacecraft Commanding	
		- Command configuration	1 hour
		- Commanding	
		- Ground script, manual, IP-ICC	

Table 4-4. FOS PDR Agenda (2 of 2)

Day	Topic	Sub-Topic	Description / Purpose
1 cont'd	Telemetry	• Monitoring	1 hour
		• NCC and EDOS Real-time I/Fs	
		• Multiple real-time contacts	
	Analysis	• History, statistics, plots, reports	1 hour
	IST Capabilities	• Key requirements	
		• Functionality	
		• Interfaces	
	Segment Engineering	• Development approach	1.75 hours
		• Integration and test approach	
		• Facilities	
		• External dependencies	
		• Security	
		• Specification	
	Closing		.25 hour

4.2.3 FOS PDR Dependencies

A successful FOS PDR is dependent upon adequate information and knowledge of external designs and requirements in three areas:

1. AM-1 Spacecraft telemetry, command and control requirements for EOC,
2. Instrument telemetry, command and control requirements for IST, and
3. Communications Systems Management Segment (CSMS) interface requirements and service provisions
    a. Internetworking Subsystem (ISS) - EOC network and interfaces to IST sites .
    b. Communications Subsystem (CSS) - Interprocess communication and security services.
    c. Management Subsystem (MSS) - systems and network management services.

The FOS development team is in frequent contact with the organizations responsible for all three and is proactive in conducting informal requirements and design walkthroughs to assure design progress to the PDR level.

4.2.4 FOS PDR Participation

4.2.4.1 Attendees

The FOS PDR is attended by designated representatives of the organizations and institutions which comprise the ECS community. A representative may serve as the proxy for a number of constituents. In this capacity, the representative will solicit issues to bring to the PDR events on the behalf of colleagues.

CDRL documents are distributed on EDHS at least two weeks in advance of the PDR event for community review and event attendance preparation. Any issues that are revealed in the document review are conveyed to the representative for the group. The representative presents accumulated issues in the course of the event. Those that are not satisfactorily resolved in discussion are recorded as RIDs.

External participation in the PDR must be coordinated through the ESDIS FOS ETM and the ECS FOS manager who will determine audience size based on their assessment of group size workability for segment PDR objectives.

The preliminary list of FOS PDR attendees is shown by organization, number of representatives, and name in Table 4-5. (Table to be completed after publication.)

Table 4-5. FOS PDR Attendance

Group / Organization	No.	Name
AM-1 project		
AM-1 Spacecraft Contractor		
AM-1 Instrument Teams		
PM project		
Code 500 Institutional Representatives		
Code 300 Quality Assurance		
Flight Operation Team		
Aster		
ECS CSMS Engineering	2	
ECS SDPS Engineering	2	
ECS Release A Manager	1	
ECS System Integ & Test	1	
ECS IATO	1	
ECS SI&P I/F Engineering	1	
ECS Chief Engineer	1	
Total		

4.2.4.2 Segment Review Panel

The FOS Segment PDR is conducted for approval of a Segment Review Panel. The panel is comprised of ESDIS and spacecraft and instrument team representatives. The panel will advise on segment PDR approval to the ESDIS FOS segment ETM. The ETM authorizes the ECS FOS segment manager to proceed to the detailed design phase of implementation without further coordination. Panel membership is shown in Table 4-6. (Table to be completed after publication.)

Table 4-6. FOS Segment Review Panel

Group / Organization	No.	Name
Chair	1	
Code 520 - OO expertise	1	
Renaissance	1	
Code 421 - AM-1 Project	1	
Code 511 Management - Control Center Expertise	1	
Total	5	

4.3 CSMS PDR Activities

The Communication Systems Management Segment utilizes its monthly ESDIS customer meetings to coordinate design activities and issues during early portions of the preliminary design period. Design trades and studies are presented as they are coming to closure at these requlary scheduled meetings.

CDRL production and distribution support the schedule of events shown in Figure 4-3, CSMS PDR Events and Schedule.

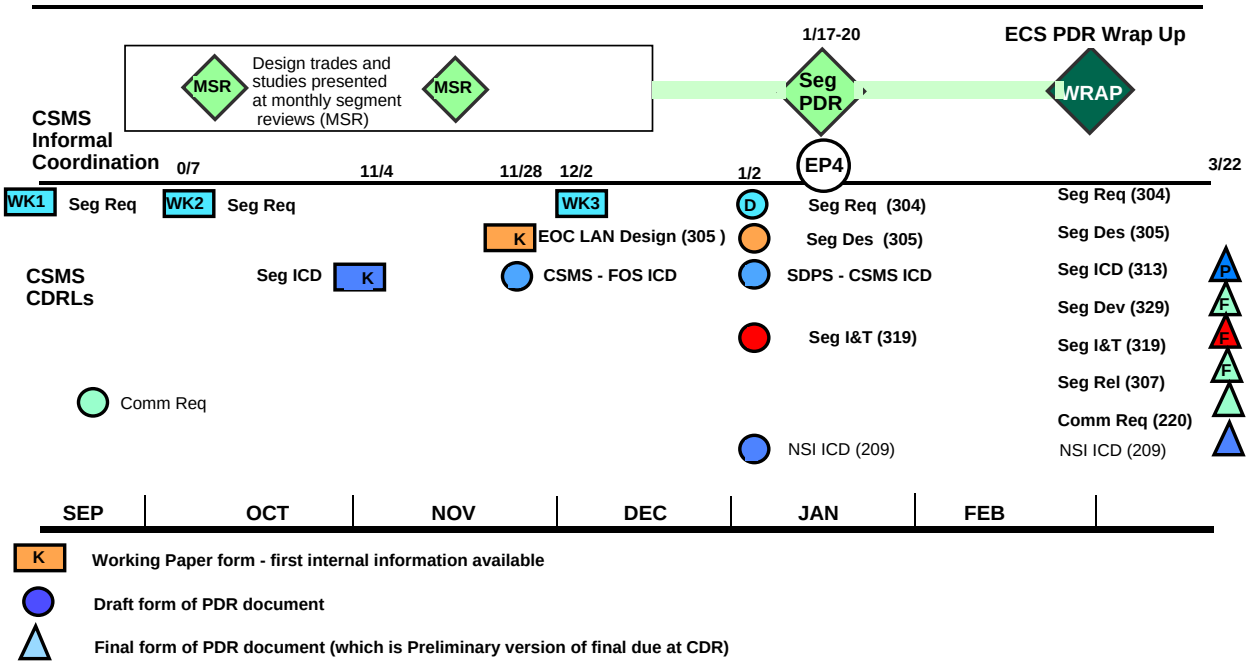

Figure 4-3. CSMS PDR Events and Schedule

4.3.1 CSMS Workshops

CSMS workshops, shown in the form of Monthly Segment Reviews (MSR) in the figure above, present and review requirements and design trades and studies from the preliminary design process. CSMS is a service provider to both FOS and SDPS and as such must define services and interfaces with the other segments in time to support their information needs. They are produced as working paper and draft versions of required CSMS documents in time to support external PDRs. The following is an overview of CSMS schedules for MPRs, CDRL Drafts, and working papers:

- Level 4 requirements working paper # 2 - 10/7/94
- Design Coordination - design trades and studies
  - Presented during CSMS segment monthly reviews 10/94, 11/94

- Internal ICD working paper- 11/4/94
- CSMS/FOS internal ICD delivery - 11/28/94 (coincident with FOS workshops)
- EOC LAN design - 11/28/94 (coincident with FOS workshops)
- Level 4 requirements final working paper - 12/2/94
- Integration and Test Plan working paper - 1/2/95
- EP4 Demonstration, User Preference Survey, and Usability Testing. Capitalize on the presence of community expertise to exercise and evaluate EP4.
  - Demonstrate EP4 to PDR participants.
  - Allow volunteer participants to operate EP4 and respond to its on-line User Preference Survey.
  - Allow selected participants to participate in the EP4 Usability Testing.

4.3.2 CSMS PDR Content/Agenda

The preliminary definition of agenda topics and sub-topics and descriptions is outlined in Table 4-7. It is expected that the agenda will evolve as the preliminary design process matures designs and uncovers issues.

The CSMS PDR will be conducted under this general framework:

- PDR has a Release IR-1 / A focus, with selective lookahead to Release B.
- The degree of lookahead varies by CSMS subsystem:
  - ISS WANs (sized for IR-1 and A; B considered only for ATM migration strategy);

    ISS LANs (sizing for A and B; technology selections for B; topology of initial installation compatible with B [e.g., run cables for B at A; may defer some buys for B-only LANs])
  - CSS requirements definition (including interfaces) for IR-1, A, and B

    CSS design and technology selection for IR-1 and A, with migration plan to B.
  - MSS requirements definition for IR-1 / A; management-framework migration strategy to B.
- Development methodology varies by subsystem:
  - ISS is all COTS and GFE hardware/software (modeling and systems integration)
  - CSS is software- and COTS-intensive; it is developed on the incremental track (the CSS part of PDR is mostly a demo; selective OMT design is done to support incremental development and interface definition)
  - MSS is software- and COTS-intensive and done on the formal track (OMT methodology)

Table 4-7. CSMS PDR Agenda (1 of 2)

Day	Topic	Sub-Topic	Description / Purpose
Day 1, AM	CSMS Overview	introduction / context setting	(EOS-->EOSDIS--> ECS--->CSMS) for outsiders
		engineering process to PDR	subsystem-specific approach
		driving requirements	functional, performance, RMA, and interface
		design decomposition to subsystems	SDR-level, updated as necessary
		summary of key results	trades, technology selections
Day 1, PM	ISS	driving requirements	functional, performance, RMA, and interface
		technology selections with rationale	standards; make vs. buy
		modeling summary	drives physical designs
		EOC LAN physical design	B, with possible A subset
		DAAC LAN physical design snapshot	B, with possible A subset
		WAN requirements	IR-1 and A
		ATM migration strategy	WAN; LAN
		risks and mitigations	
		evolution tests	
Day 2, AM	CSS	driving requirements	functional, performance, RMA, and interface
		design decomposition to service classes	SDR-level, updated as necessary
		technology selections with rationale	standards; make vs. buy
		EP4 Demo	and selected later CSMS prototypes, as available and useful
		EOC CSS physical design	Release A
		DAAC CSS physical design	IR-1 and A
		DCE to CORBA migration strategy	
		risks and mitigations	
		evolution tests	
Day 2, PM		Continuing ISS and CSS discussion	RID workoff and prioritization

Table 4-7, CSMS PDR Agenda (2 of 2)

Day	Topic	Sub-Topic	Description / Purpose
Day 3, AM	MSS	driving requirements	functional, performance, RMA, and interface
		management scenarios and ops concepts	
		OMT design	IR-1 and A
		technology selections	standards; make vs. buy), with rationale
		EOC MSS physical design	Release A
		DAAC MSS physical design	IR-1 and A
		OpenView to DME and/or OMF migration strategy	
		risks and mitigations	
		evolution tests	
Day 3 PM		Continuing MSS discussion	RID workoff and prioritization
Day 4, AM	Summary (1/2 day)	I&T approach	build thread for IR-1 and A
		Segment development plan/process; LOC estimates	
		Next steps (IR-1, CDR-A)	
		Issues capture / summary	
Day 4, PM		CSMS PDR Review Panel Wrap Up	Action Item review, CSMS PDR approval

4.3.3 CSMS PDR Dependencies

Parts of CSMS design depend critically on SDPS design. Therefore, the CSMS PDR, which will take place a month ahead of SDPS PDR, will be based upon preliminary definitions of key SDPS requirements for CSMS services. The CSMS design will be updated in its segment CDRLs (delivered in Final or Preliminary form after the SDPS PDR and the ECS Wrap Up) where preliminary requirements change. Some key areas of concern:

- LAN Design
- Software CM for algorithm I&T
- Scheduling approach
- Accounting
- Application management
- Startup / Shut down / backup

- DAAC reporting requirements
- DAAC Autonomy with respect to SMC

4.3.4 CSMS PDR Participation

4.3.4.1 Attendees

The CSMS PDR is attended by designated representatives of the organizations and institutions which comprise the ECS community. A representative may serve as the proxy for a number of constituents. In this capacity, the representative will solicit issues to bring to the PDR events on the behalf of colleagues.

CDRL documents are distributed on EDHS at least two weeks in advance of the PDR event for community review and event attendance preparation. Any issues that are revealed in the document review are conveyed to the representative for the group. The representative presents accumulated issues in the course of the event. Those that are not satisfactorily resolved in discussion are recorded as RIDs.

External participation in the PDR must be coordinated through the ESDIS CSMS ETM and the ECS CSMS manager who will determine audience size based on their assessment of group size workability for segment PDR objectives.

The list of CSMS PDR attendees is shown by organization, number of representatives, and name in Table 4-8. (Table to be completed after publication.)

4.3.4.2 Segment Review Panel

The CSMS Segment PDR is conducted for approval of a Segment Review Panel. The panel is comprised of ESDIS, NASA Headquarters, focus team and industry representatives. The panel will recommend PDR approval to the ESDIS CSMS segment ETM. The ETM authorizes the ECS CSMS segment manager to proceed to the detailed design phase of implementation without further coordination. Panel membership is shown in Table 4-9. (Table to be completed after publication.)

Table 4-8. CSMS PDR Attendance

Group / Organization	No.	Name
CSMS rep (ESDIS)		
SDPS rep (ESDIS)		
FOS rep (ESDIS)		
IV&V contractor		
EDOS contractor rep		
Code 300 Quality Assurance		
SI&P CM		
ECS FOS Engineering		
ECS SDPS Engineering		
ECS Release A Manager		
ECS System Integ & Test		
ECS IATO		
ECS SI&P I/F Engineering		
ECS Chief Engineer		
DAAC SE liaisons		
M&O rep		
QO rep		
Total		

Table 4-9. CSMS Segment Review Panel

Group / Organization	No.	Name
Panel Leader	1	
Network Representatives		
SOFT		
NSUN/user reps		
ESDIS		
Independent technologists		
Total		

4.4 SDPS PDR Activities

The Science Data Processing Segment utilizes a series of bi-weekly telephone conferences to coordinate design activities and issues with its user base during early portions of the preliminary design period, followed by a Level 4 Requirements Workshop, and the segment PDR.

CDRL production and distribution support the schedule of events shown in Figure 4-4, SDPS PDR Events and Schedule.

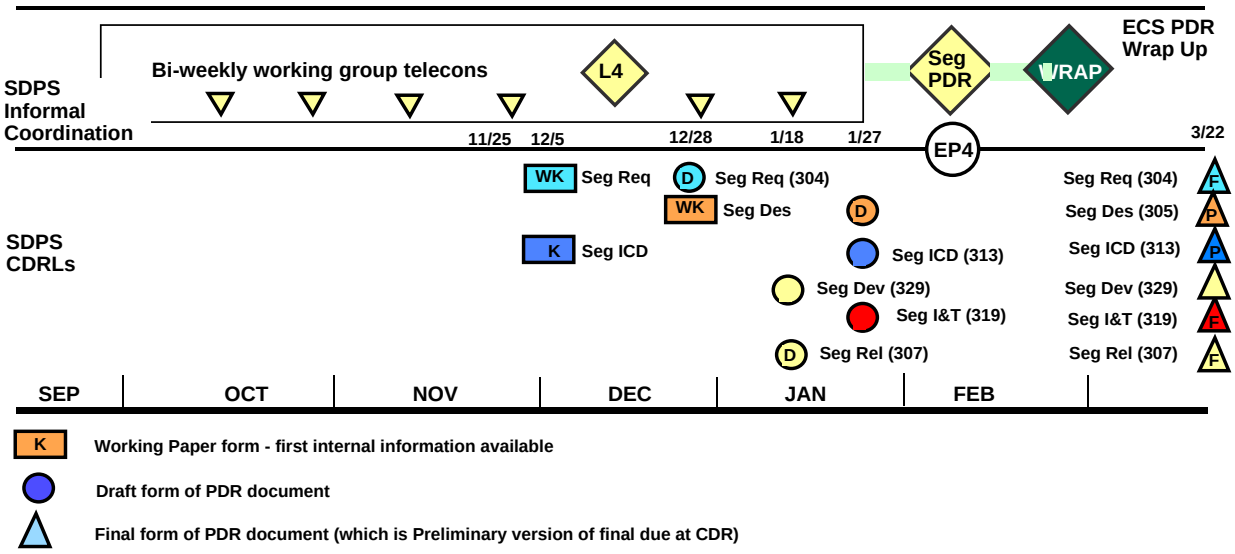

Figure 4-4. SDPS PDR Events and Schedule

4.4.1 SDPS Workshops

SDPS workshops include the bi-weekly telephones conferences for early requirements and design coordination, and a Level 4 Requirements Workshop in December, 1994. The inverted triangles shown every two weeks from September, 1994 through January, 1995 represent the telecons, and the L4 Diamond represents the requirements workshop in the figure above. The following outline schedule identifies key events and the CDRL working papers and Drafts published to support them along with planned dates:

1. DID 304 Segment Level 4 Requirements Workshop
    - delivery 12/1/94 for review by ESDIS and Design Group
    - review via telecon with Design Group 12/8-9/94
    - Workshop for Design Group 12/15-16/94
    - Informal ESDIS reviews proceeding Oct - Dec 94
    - PDR Draft delivered 1/9/95

2. DID 305 Segment Design Specification (includes internal ICD 313))
    - draft due 1/8/95 for inter segment and ESDIS review
    - review comments due back 1/16/95
    - PDR Draft delivered 1/30/95
    - PDR final (target PDR + 4 weeks)
    - CSMS / FOS interfaces designed to their schedules
3 DID 311 Segment Data Model
    - delivery 12/1/94 - core metadata baseline
    - delivery 1/9/95 - collection-specific metadata
    - PDR Draft delivered 1/30/95 (metadata, browse, CSDTs, subsetting, system)
    - Scope is Release A products, TSDIS Products, V0 Products migrated in Rel A time frame, Rel B Products (as many as makes sense).
4. DID 211 Trade Study Data
    - available at PDR
5. EP4 Demonstration, User Preference Survey, and Usability Testing. Capitalize on the presence of community expertise to exercise and evaluate EP4.
    - Demonstrate EP4 to PDR participants.
    - Allow volunteer participants to operate EP4 and respond to its on-line User Preference Survey.
    - Allow selected participants to participate in the EP4 Usability Testing.

4.4.2 SDPS PDR Content/Agenda

The preliminary definition of agenda topics and sub-topics and descriptions is outlined in Table 4-10. It is expected that the agenda will evolve as the preliminary design process matures designs and uncovers issues.

Table 4-10. SDPS PDR Agenda (1 of 3)

Day	Topic	Sub-Topic	Description / Purpose
1 PM	Introductions		.5 hour
	Design Overview	changes since SDR	1.5 hours
	SDPS Engineering Process	• Engineering process • Formal Vs Incremental Track • EPs and prototypes • Engineering Issues • Scale of dev (LOC estimates)	1.5 hours, shows functional mapping to formal and Incremental track
	Segment Review Panel	closed session	.5 hour
2	Segment Review Panel	Issues summary	30 min review of issues from previous day
	System Modeling	• Approach • Push - AHWGP summary and impact • Pull Generator • System Impacts • Baseline	1 hour
	Data Modeling	• Scope • Activities / approach • Core Metadata selection • use of User Scenarios • Consumers/producers/stewards - responsibilities • Logical data servers • CSDT Mapping • Current Issues	1.5 hours
	Cost Drivers	• Requirements cost drivers • design/process mitigation • baseline issues	1 hour
	Processing (PDPS)	• Design Issues • SMC Planning (CSMS involved)	1.5 hours
	ECS Response to RP issues	discussion of issues raised that morning with intent to close all possible; prioritize and write RID or Action Item on those remaining	.5 hour
	Segment Review Panel	closed session	.5 hour
3	Segment Review Panel	Issues summary	30 min review of issues from previous day
	DADS Design Issues	Issues raised through group telecons and L4 Workshop	1 hour
	IMS Design Issues	Issues raised through group telecons and L4 Workshop	1.5 hours

Table 4-10. SDPS PDR Agenda (2 of 3)

Day	Topic	Sub-Topic	Description / Purpose
	Software Implementation	• S/W Bill of Materials (Generic Type) • S/W selection Trade Studies • S/W Issues • Benchmarking and Prototyping • API - Number and scope	2.5 hours. DBMS, desktop, HSM/FSMS, queuing, type service, client/server protocols, CSS I/Fs.
	ECS Response to RP issues	discussion of issues raised that morning with intent to close all possible; prioritize and write RID or Action Item on those remaining	.5 hour
	Segment Review Panel	closed session	.5 hour
4	Segment Review Panel	Issues summary	30 min review of issues from previous day
	Hardware Implementation	• H/W Bill of Materials (Generic) • Key selection Trade Studies • Outstanding Issues	1 hour. Network attached storage, storage robots, processing strings, post-launch ramp up.
	DAAC Operations	• Algorithm I&T • Schema Management • Ingest/distribution mgt • Production planning • Interaction with SMC mgt directives	1 hour
	IAS Issues / Analysis	• Outline of each architecture • Map IAS PDR issues to preceding discussions • present analysis on topics not covered elsewhere	1 hour
	V0 Integration / Data Migration	• Release A V0 analysis study • Release A Data Migration • Data Migration cost modeling	1.5 hours
	ECS Response to RP issues	discussion of issues raised that morning with intent to close all possible; prioritize and write RID or Action Item on those remaining	.5 hour
	Segment Review Panel	closed session	.5 hour
5	Segment Review Panel	Issues summary	30 min review of issues from previous day
	Prototype Presentation and Demos (Panel may hold parallel session to finalize issues)	• Introduction to SDPS Prototyping • Demos	2 hours

Table 4-10. SDPS PDR Agenda (3 of 3)

Day	Topic	Sub-Topic	Description / Purpose
	ECS Response to RP issues	discussion of issues raised that morning with intent to close all possible; prioritize and write RID or Action Item on those remaining	.5 hour
	Review Panel Final Issues Wrap Up	Panel summary of Action Items (Priority 1 issues) and Assessment of readiness for detailed design phase.	1.5 hours
	Review Close		
	Release A DAAC Splinter Sessions (PROPOSED) • MSFC • LaRc • GSFC • EDC	• DAAC-specific configurations • V0 Interfaces • DAAC uniques	

4.4.3 SDPS PDR Dependencies

The SDPS is dependent on satisfactory definition / resolution of the following items for successful completion of its PDR:

1. AHWGP Baseline
2. Facility Plans
3. SMC process planning
4. Allocation of performance requirements
5. Impact of VAP concept in PDR presentation

4.4.4 SDPS PDR Participation

4.4.4.1 Attendees

The SDPS PDR is attended by designated representatives of the organizations and institutions which comprise the ECS community. A representative may serve as the proxy for a number of constituents. In this capacity, the representative will solicit issues to bring to the PDR events on the behalf of colleagues.

CDRL documents are distributed on EDHS at least two weeks in advance of the PDR event for community review and event attendance preparation. Any issues that are revealed in the document review are conveyed to the representative for the group. The representative presents accumulated issues in the course of the event. Those that are not satisfactorily resolved in discussion are recorded as RIDs.

External participation in the PDR must be coordinated through the ESDIS SDPS ETM and the ECS SDPS manager who will determine audience size based on their assessment of group size workability for segment PDR objectives.

The preliminary list of SDPS PDR attendees is shown by organization, number of representatives, and name in Table 4-11. (Table to be completed after publication.)

Table 4-11. SDPS PDR Attendance

Group / Organization	No.	Name
Segment Review Panel	17	
Data Panel / AHWGP	5	
Design Working Group	5	
DAAC Mgrs, scientists, engineers	15	
TRMM Interface	2	
AM-1 Interface	2	
ESDIS	10	
NASA HQ	0	
other NASA	0	
Code 300 Quality Assurance		
ECS System Integ & Test		
ECS IATO	1	
ECS SI&P I/F Engineering	1	
ECS Chief Engineer	1	
other Agencies	3	
Sys developers/system integrators	0	
International Partners	0	
ECS Answer Panel	15	
ECS CSMS Engineering		
ECS FOS Engineering		
ECS Release A Manager	1	
Total	74	

4.4.4.2 Segment Review Panel

The SDPS Segment PDR is conducted for approval of a Segment Review Panel. The panel is comprised of ESDIS, NASA Headquarters, and System Advisory Panel (Data Panel and DAAC) representatives. The panel will advise on segment PDR approval to the ESDIS SDPS segment ETM. The ETM authorizes the ECS SDPS segment manager to proceed to the detailed design phase of implementation without further coordination.

Panel membership is shown in Table 4-12. (Table to be completed after publication.)

Table 4-12. SDPS Segment Review Panel

Group / Organization	No.	Name
Panel Leader	1	
Data Panel	2	
SDPS Design Working Group	2	
ESDIS	2	
ECS Tirekickers	2	
IDS community	2	
Systems people	2	
DAACs	2	
NASA HQ	2	
Total	17	

5. PDR Documentation

PDR documentation is tailored to the adopted ECS PDR design and will facilitate inter-segment engineering, particularly in the area of interfaces. The ECS Data Handling System (EDHS) will facilitate document distribution and review throughout the PDR process. Each level of documentation and format at delivery is described below, along with the distribution process intended for each cycle of the PDR process.

5.1. Document Definitions and Formats

The PDR documentation set hierarchy is as follows:

WK **Working Papers—**Working Papers are early versions of CDRL source material for internal distribution and limited distribution at GSFC. They are intended to further discussion and development of CDRL PDR documents. Working Papers are submitted with little attention to format and display the caveat "Working Paper—For Internal Distribution Only" on the cover and within the document footer.

R **Review Copy—**Review Copies of PDR documents are delivered as required by the CDRL and defined by the Data Item Descriptions. Prior to submittal to GSFC, these documents are boarded by ECS at the segment-or ECS-level CCBs, or approved at the Project Management level. A listing of the control and approval level of these deliverables is provided in ECS-internal Project Instruction DM-1-001.

Review Copies are intended to be redlined during the Segment-or System-Level Level PDR. NASA format will not be strictly adhered to in Review Copy, but the DMO-provided CDRL template will be used whenever possible. Authors will attempt to deliver Drafts as a single electronic file with tables and graphics embedded, to ease electronic distribution via the EDHS. Review Copy submittals are clearly marked as "Review Copy" and carry a caveat on the cover that the document is submitted for review and/or approval and will be resubmitted after comments have been incorporated.

F P **Final and Preliminary**—Final and Preliminary copies are submitted after comments have been incorporated into Review Copies. They are prepared and submitted in NASA-approved format. Final or Preliminary submittals available via EDHS carry a caveat on the cover that "This document has been submitted for approval by the Government and is not intended for general distribution." Once the document is approved, the caveat is removed.

5.2 PDR Document Delivery Schedule

PDR documents will be delivered following the PDR model. Delivery dates along with format in which document will be delivered are listed in Appendix B. The information is listed chronologically by target delivery date; delivery dates listed are No-Later-Than (NLT). Accomplishments against this schedule will be reported at ECS Monthly Progress Reviews and will be available via the EDHS.

Seven segment-specific CDRL items will be developed at the segment level and each will be delivered as a separate sub-document within each of the following DID/CDRL numbers:

- DID 304/DV1 Segments Requirements Specification
- DID 305/DV1 Segments Design Specifications
- DID 307/DV2 Segment Release Plans
- DID 311/DV1 Database Design and Database Design Schema Specifications
- DID 313/DV3 ECS Internal Interface Control Documents
- DID 319/DV1 Segment Integration and Test Plans
- DID 329/DV2 Segment Development Plans

The ECS System Integration & Planning Office (SI&P) will provide a template for each of these documents for use by the segments to ensure consistent organization, content and format. A coordinating engineer will be identified within SI&P who will provide guidance to the segment authors of each document.

5.3. PDR Document Delivery Process

The processes for distributing each level of PDR documentation vary according to the maturity level of the document and intended audience:

- **Final and Preliminary**—Hard copy of Final and Preliminary submittals will be delivered to GSFC Data Management as required by the CDRD or as directed by the GSFC Contract Officer. All Final and Preliminary deliverables will also be available electronically to the science community via the EDHS.
- **Review Copy—**Review copies of CDRL documentation are distributed in anticipation of each Segment or the System-level PDR (NLT 2 weeks prior). Distribution will be facilitated via EDHS; however, hard copy will be delivered to GSFC Data Management for dissemination within Code 505 as required.
- **Working Papers—**Working papers are circulated in anticipation of or at each workshop session. Distribution is limited to workshop attendees or designees. Working Papers are usually distributed as hard copy only with little attention to format. Electronic copy in native file or postscript may be disseminated via ftp or local home pages within the EDHS.

Feedback to document developers will be provided throughout the PDR document development and delivery process as defined in Section 4.0.

Final and Preliminary PDR deliverables are also subject to a final GSFC review and approval process as outlined in the CDRD and instituted during SDR. A lead reviewer is assigned at GSFC to distribute copies to specific GSFC and DAAC personnel and members of the science community, and to coordinate review comments received. Generally, Final and Preliminary document submittals are approved or disapproved in one of the following ways:

- Approved as submitted
- Approved with comments to be incorporated either when the document is available for general distribution or at the next update
- Disapproved with comments attached

This page intentionally left blank.

6. PDR Logistics

6.1 PDR Location

To the fullest extent possible, PDR-related events will occur at the ECS Development Facility in Landover. This allows maximum flexibility in providing co-located meeting rooms for plenary and break-out sessions, as well as demonstrations held in parallel. The following meeting space will be available:

- Auditorium—Seats 200 theater style or can be configured to accommodate U-shape for 40. Two large overhead screens with computer projection capability are available.
- Conference Room 2030—Newly opened, this room has a single conference table for 18 and side theater seating for 75. Two overhead projectors and screens, and white boards are available. A conference phone is available for teleconference calls.
- Mid-Size Breakout Rooms—15 rooms that seat 10 at a conference table with side seating for 18. Each has white boards and overhead projector and screen, as well as telecon capability.
- Smaller Breakout Rooms—15 rooms that seat 8 at a conference table with side seating for 18. Each has white boards and overhead projector and screen, as well as telecon capability.

The Auditorium and Conference Room 2030 are reserved for the three segment and system-level wrap up Reviews.

6.2 Logistics Support

With direction from the the ECS PDR Manager, the ECS Review Coordinator will reserve meeting space and arrange for on-site support. This includes ensuring that appropriate computer and audio-visual equipment is available and in good working order, and providing participants with administrative support such as fax, photocopy, and computers for e-mail or word processing.

The Review Coordinator will also assist GSFC management in notifying participants of meeting times and location and provide other logistics support as required.

This page intentionally left blank.

Appendix A. Object Methodology PDR Checklist

1 **General**

1.1. All system scenarios in which subsystem participates are represented

1.2. System scenarios map to subsystem scenarios

1.3. L4 requirements are allocated to subsystem scenarios

1.4. Scenario supports allocated requirements

1.5. Sequence of classes is correct, complete

1.6. Interfaces between segments and subsystems are coordinated

1.7. All external interfaces are captured; At Least One I/F Class per Subsystem Pair

2 **Object Models**

2.1. All classes have been identified

2.2. Assure that associations reflect semantic relationships..

2.3. Every class supports L4 requirements, and no more; i.e. design to cost/requirements

2.4. Every allocated requirement is explicitly covered by a class or association

2.5. Every class maps to a scenario

2.6. Interfaces to all external actors have been coordinated with the other side of the interface

3 **Dynamic & Functional Models**

3.1. All scenarios in which the subsystem participates are represented

3.2. Sequence of classes represents the scenario/thread

3.3 Functional Models must be complete where used.

3.4 Functional models are used where complexity dictates.

4 **Class Definitions**

4.1. All attributes are defined

4.2. All operations are identified

4.3. All operations support a requirement

4.4. Operations perform one function

4.5. Size of operations is reasonable

(average size less than 100 LOC unless good reason; never more than 250 LOC)

5 **Interface Classes**

5.1. Minimal functionality

5.2. Represents both sides of the interface

5.3. Ownership for development is firmly established

5.4. Dependencies are well understood

5.5. State Diagram provided

6. **Overall Consistency**

6.1 L4 Requirements map to L3 and Scenarios which map to Dynamic Models which map to Classes

6.2 The Data Dictionary must be complete.

Appendix B. PDR Document Delivery Schedule

Target PDR Delivery Date Matrix (Subject to Change)

Last update: November 22, 1994

DID Number	Document Title	NLT Due Date
206-CD-001	V0 Analysis Report (D for CSMS PDR)	95.01.02
206-CD-001	V0 Analysis Report (D for SDPS PDR)	95.01.27
206-CD-001	V0 Analysis Report (F)	95.02.08
209-CD-001-001	NSI ICD (P)	95.01.02
209-CD-002-001	ASTER GDS ICD (P)	94.12.02
209-CD-003-001	AM-1 S/CAnalysis S/W ICD (P)	94.11.30
209-CD-004-001	AM-1 DBDC ICD (P)	94.11.30
209-CD-005-001	SCF ICD (P)	95.01.31
209-CD-006-001	ADCs ICD (P)	95.01.31
209-CD-007-001	TSDIS ICD (P)	95.01.31
209-CD-008-001	GSFC DAAC ICD (P)	95.01.31
209-CD-009-001	MSFC DAAC ICD (P)	95.01.31
209-CD-010-001	LaRC DAAC ICD (P)	95.01.31
209-CD-011-001	V0 ICD (P)	95.01.31
210-CD-001-001	Risk Assessment Report	95.02.08
211-CD-001-001	Trade-off Studies Analysis Data (R/System Wrapup)	95.02.08
211-CD-001-002	Trade-off Stud. Analy. Data (F/ System Wrapup)	95.03.22
213-CD-001-001	Life Cycle Cost Report	95.02.08
214-CD-001-001	ECS Security Plan	95.02.08
215-CD-001-001	Security Risk Analysis Report	95.04.22
220-CD-001-002	Communications Requirements (F)	95.01.02
304-CD-001-001	Segment Requirements Specification (R)	94.11.29
304-CD-001-002	Segment Requirements Specification (F)	95.01.31
304-CD-002-001	Segment Requirements Specification (R)	95.01.31
304-CD-002-002	Segment Requirements Specification (F)	95.03.22
304-CD-003-001	Segment Requirements Specification (R)	95.01.02
304-CD-003-002	Segment Requirements Specification (F)	95.03.22
305-CD-001-001	Segment/ Design Specifications (R)	94.11.29
305-CD-001-002	Segment/ Design Specifications (F)	95.01.02
305-CD-002-001	Segment/ Design Specifications (R)	95.01.31
305-CD-002-002	Segment/ Design Specifications (F)	95.03.22
305-CD-003-001	Segment/ Design Specifications (R)	95.01.31

(D) Working Draft (R) Review Copy per CDRL for review and or approval (F/P) Updated Copy incorporating comments

DID Number	Document Title	NLT Due Date
305-CD-003-002	Segment/ Design Specifications (F)	95.03.22
307-CD-001-001	Segment Release Plans (R)	94.11.29
307-CD-001-002	Segment Release Plans (F)	95.01.31
307-CD-002-001	Segment Release Plans (R)	95.01.31
307-CD-002-002	Segment Release Plans (F)	95.03.22
307-CD-003-001	Segment Release Plans (R)	95.01.02
307-CD-003-002	Segment Release Plans (F)	95.03.22
311-CD-001-001	Database Des.ign/Schema Spec (R)	94.11.29
311-CD-001-002	Database Des.ign/Schema Spec (F)	95.01.31
311-CD-002-001	Database Des.ign/Schema Spec (R)	95.01.31
311-CD-002-002	Database Des.ign/Schema Spec (F)	95.03.22
311-CD-003-001	Database Des.ign/Schema Spec (R)	95.01.02
311-CD-003-002	Database Des.ign/Schema Spec (F)	95.03.22
313-CD-001-001	ECS Internal ICDs (R)	94.11.29
313-CD-001-002	ECS Internal ICDs (F)	95.01.31
313-CD-002-001	ECS Internal ICDs (R)	95.01.31
313-CD-002-002	ECS Internal ICDs (F)	95.03.22
313-CD-003-001	ECS Internal ICDs (R)	95.01.02
313-CD-003-002	ECS Internal ICDs (F)	95.03.22
319-CD-001-001	Segment Integration & Test Plan (R)	94.11.29
319-CD-001-002	Segment Integration & Test Plan (F)	95.01.31
319-CD-002-001	Segment Integration & Test Plan (R)	95.01.31
319-CD-002-002	Segment Integration & Test Plan (F)	95.03.22
319-CD-003-001	Segment Integration & Test Plan (R)	95.01.02
319-CD-003-002	Segment Integration & Test Plan (F)	95.03.22
329-CD-001-001	Segment/Element Development Plans (R)	94.11.29
329-CD-001-002	Segment/Element Development Plans (R)	95.01.31
329-CD-002-001	Segment/Element Development Plans (R)	95.01.31
329-CD-002-002	Segment/Element Development Plans (F)	95.03.22
329-CD-003-001	Segment/Element Development Plans (F)	95.01.02
329-CD-003-001	Segment/Element Development Plans (F)	95.03.22
402-CD-001-002	ECS Sys Integration & Test Plan (F)	95.02.08
403-CD-001-002	Verification Specification (F)	95.02.08
513-CD-001-001	Hazard Analyses (R)	95.02.08
513-CD-001-002	Hazard Analyses (F)	95.03.22
514-CD-001-001	Security-Sensitive Items List	95.02.08
515-CD-001-001	Availability Models/Predictions (R)	95.02.08
515-CD-001-002	Availability Models/Predictions (F)	95.03.22
516-CD-001-001	Reliability Predictions (R)	95.02.08
516-CD-001-002	Reliability Predictions (F)	95.03.22

(D) Working Draft (R) Review Copy per CDRL for review and or approval (F/P) Updated Copy incorporating comments

DID Number	Document Title	NLT Due Date
517-CD-001-001	Failure Modes & Effect Analyses & Critical Items List (R)	94.11.29
517-CD-001-002	Failure Modes & Effect Analyses & Critical Items List (F)	95.01.31
518-CD-001-001	Maintainability Predictions (R)	95.02.08
518-CD-001-002	Maintainability Predictions (F)	95.03.22
520-CD-001-001	S/W Critical Items List (O) (per currently proposed Code 300 CCR)	95.02.08
522-CD-001-001	Integration & Inspection Flow Plan	95.02.08
601-CD-001-001	M & O Mngmnt Plan (R)	95.02.08
601-CD-001-002	M & O Mngmnt Plan (F)	95.03.22
613-CD-001-001	COTS Maintenance Plan (P)	94.12.15
614-CD-001-001	Developed Software Maintenance Plan (F)	95.02.08
615-CD-001-001	Special Maintenance & Test Equipment (F)	95.01.17
617-CD-001-001	Logistics Support Analysis Plan (F)	94.12.15
622-CD-001-001	ECS Training Plan (F)	94.12.15
627-CD-001-001	Security Risk Management Plan (F)	95.05.22
704-CD-001-002	PDR Presentation Pkg (F)	95.03.08
713-CD-001-002	PA Review & Presentation Package (F)	TBD